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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/253,306	02/19/1999	DONALD S. GARDNER	042390.P5832	5456

7590 11/17/2003

WILLIAM THOMAS BABBITT
BLAKELY SOKOLOFF TAYLOR & ZAFMAN
SEVENTH FLOOR
12400 WILSHIRE BOULEVARD
LOS ANGELES, CA 90025

EXAMINER

TRAN, THIEN F

ART UNIT PAPER NUMBER

2811

DATE MAILED: 11/17/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/253,306

Applicant(s)

GARDNER ET AL.

Examiner

Thien F Tran

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 August 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 4-6, 9-11, 14-16 and 19-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 4-6, 9-11, 14-16 and 19-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4-5, 9-10, 14-15 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. (USPN 5,641,992).

Lee et al. discloses an interconnection (Fig. 1) on a substrate of an integrated circuit comprising an aluminum copper titanium alloy layer 24, wherein the aluminum copper titanium alloy layer (Table I) comprises 0.15 % titanium, 0.5 % copper and the remainder is aluminum. Lee et al. does not specifically disclose the percent as atomic percent or weight percent. Assuming it is the atomic percent then the aluminum alloy layer of Lee et al. read on the claim. On the other hand if the percent is the weight percent, then the atomic percent of titanium and the atomic percent of copper in the alloy layer 24 of Lee et al. are close enough that one skilled in the art would have expected them to have the same properties. Furthermore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the alloy layer of Lee et al. having the claimed range of atomic percent for the titanium and copper in the alloy, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (see MPEP 2144.05).

Regarding claim 22, Lee et al. discloses the interconnect having composition of titanium, copper and aluminum as claimed, it is inherent that the interconnect has a resistance in the claimed range.

Claims 6, 11, 16 and 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Inoue et al. (USPN 5,635,763) in view of Lee et al. (USPN 5,641,992).

Inoue et al. discloses a semiconductor device comprising a multilayered interconnection structure (Figs. 3A-3B) formed on a substrate 1, the interconnection comprises a second titanium nitride layer 9 overlying a second titanium layer 21, an aluminum alloy layer 10 overlying the second titanium nitride layer 9, a first titanium layer 23 overlying the aluminum alloy layer 10, and a first titanium-nitride layer 11 overlying the first titanium layer 23. Inoue et al. does not explicitly disclose the layer 10 being an aluminum-copper-titanium alloy layer. Lee et al. as described above discloses an aluminum-copper-titanium alloy layer. It would have been obvious to a person having ordinary skill in the art at the time the invention was made to form the aluminum alloy layer 10 of Inoue et al. comprising aluminum-copper-titanium as taught by Lee et al. so that the interconnection structure has improved electromigration reliability and low resistance. As a result, the alloy layer 10 comprises aluminum-copper-titanium wherein the percent of titanium and copper in the alloy if considered as atomic percent read on the claims. On the other hand, if the percent is weight percent then the atomic percent of titanium and the atomic percent of copper in the alloy layer 10 are close enough that one skilled in the art would have expected them to have the same properties.

Furthermore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the alloy layer 10 having the claimed range of atomic percent for the titanium and copper in the alloy, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (see MPEP 2144.05).

Response to Arguments

Applicant's arguments filed 08/08/2003 have been fully considered but they are not persuasive.

Applicant errs when arguing that independent claims 4, 9, 14 and 16 recite an interconnection comprising an aluminum-copper-titanium alloy layer containing about 0.1 atomic percent titanium. Independent claims 4, 9, 14 and 16 clearly recite an aluminum copper titanium alloy layer comprising less than 0.57 atomic percent titanium.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., worst electromigration performance) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Applicant argues that Lee teaches away from an aluminum-copper-titanium alloy since Lee teaches that this alloy offers the worst electromigration performance; therefore, Lee would not disclose the same properties as claims 4, 9, 14 and 16. The examiner respectfully disagrees with the remark because claims 4, 9, 14 and 16 do not

claim any properties. Furthermore, Applicant's argument cannot replace evidence when evidence is necessary. Lee clearly teaches an alloy having the same composition as claimed; therefore, the Patent Office has reason to believe that the properties, in fact, be an inherent characteristic of the prior art. It is a burden on applicant to provide convincing evidence to prove that the subject matter shown to be in the prior art does not possess the characteristics relied on. See MPEP 716.01(c) for examples of attorney statements which are not evidence and which must be supported by an appropriate affidavit or declaration.

Also it is noted that Lee does not specifically teaches that the alloy layer (test sample #1) offers the worst electromigration. This alloy layer may not be the best compared with the materials and structure listed in Table I of Lee for improving electromigration but if compared with other materials known in the art, such as some of the materials disclosed in applicant's invention, the alloy layer of Lee would offers better electromigration.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

Application/Control Number: 09/253,306
Art Unit: 2811

Page 6

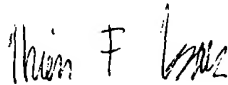
extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thien F Tran whose telephone number is (703) 308-4108. The examiner can normally be reached on 8:30AM - 5:00PM Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C Lee can be reached on (703) 308-1690. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9318.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

tt
November 12, 2003


Thien F. Tran
Primary Examiner